Straining an axially loaded slender column

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The article considers processes of straining rectilinear ideal and nonideal (inhomogeneous) bars with the flexibility parameter λ = 867 caused by an axial compressive force, and these processes are compared. A bar is assumed to be inhomogeneous when a liner of small volume and reduced stiffness is located asymmetrically in the center of the bar. Steel bars are articulated on the ends. The analysis of the mechanical behavior of the bars is carried out using volumetric finite elements in the program complex LS-DYNA in a dynamic formulation. The design model takes into account geometric and physical nonlinearity, plasticity, isotropy, the real diagram of material deformation. The results of analysis are in the function of time, which makes it possible to observe the deformation process in the running time mode. A video illustrating this process is given. It is shown that the deformations of an ideal bar are due to the Poisson effect, there are no bending deformations. It is found that for a nonideal bar there is a critical force at which buckling of bar occurs, which is associated with significant transverse displacements (deflections). The value of the obtained critical force agrees with the well-known Euler's solution.

Keywords: *bar stability, flexible bars, buckling, material straining, Euler problem, Poisson effect, technological deviations, critical load, finite element simulation*

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